11 years (range 14–74). All had at least one documented episode of spontaneous tachycardia. None had organic heart disease. Twelve pts attributed the onset of symptoms to exercise or sport activities. Six of these 12 pts underwent treadmill exercise test without inducible tachycardia. During electrophysiologic studies, all pts demonstrated dual AV nodal physiology, and 10 pts showed inducible 1–2 AV nodal echo beats. These 10 pts underwent selective RFCA of the slow pathway with successful elimination of the dual AV nodal physiology. With the mean follow-up (F/U) of 26 ± 12 mo (range 3–56 mo), none of the 10 pts who received RFCA had recurrences of symptoms (F/U 3–32 mo). In the remaining 9 pts without RFCA, 3 pts developed tachycardia recurrence (F/U 10–56 mo); 2 of these 3 pts consequently underwent RFCA and the other received verapamil with successful control of the symptoms. We conclude that pts with documented spontaneous tachycardia and the presence of dual AV nodal physiology without inducible AVNRT are predominantly male, whose symptoms are often triggered by exercise. Selective RFCA of the slow pathway seems to be beneficial to this group of pts, especially to those with inducible AV nodal echo beats.

## 983 Advances in Internal Defibrillation/Defibrillators

Tuesday, March 18, 1997, 9:00 a.m.–11:00 a.m.
Anaheim Convention Center, Hall E
Presentation Hour: 10:00 a.m.–11:00 a.m.

### 983-127 Improved Defibrillation Efficacy with a Triad Defibrillation System Using a 90 uF Capacitor

M. Bahu, B.P. Knight, R. Weiss, W. Paladino, S. Hahn, R. Goyal, E.G. Daoud, M. Harvey, K.C. Man, F. Morady, S.A. Strickberger. *University of Michigan, Ann Arbor, MI, USA*

A variety of factors, including defibrillation waveform, electrode configuration, and electrode polarity, may influence the defibrillation efficacy of an implantable defibrillator (ICD). The routine achievement of lower defibrillation thresholds may allow for a reduction in ICD size, simplify the implantation procedure, and improve patient acceptance of this therapy. In this study, the defibrillation threshold of two defibrillation systems were compared in 26 consecutive patients. Both systems used a transvenous lead with in-line anodal and cathodal coils. With the standard system, a biphasic waveform pulse was delivered from a 125 uF capacitor. The second system used an identical biphasic waveform and lead system as the standard system, but used a 90 uF capacitor, and utilized the ICD generator "can" as a third electrode. The standard system had a higher defibrillation threshold (DFT) (10.8 ± 5.5 J) than did the three electrode system (8.9 ± 6.7 J vs., p = 0.05); however, the peak voltage was similar between the two systems (361 ± 103 V vs. 397 ± 123 V, p = 0.07). The standard system also had higher defibrillation resistance (49.0 ± 9.0 ohms vs 41.4 ± 7.3 ohms, p = 0.07) and lower peak current (7.7 ± 2.6 A vs. 10.1 ± 3.7 A, p < 0.005) than the other system. In conclusion, the combination of a smaller capacitor resulting in a shorter duration waveform with an ICD generator used as a third electrode is associated with a 20% lower DFT than observed with a transvenous system alone. The combination of smaller capacitors and a trial defibrillation system provide for lower DFT's and may allow for continued ICD miniaturization.

### 983-128 Feasibility and Long-Term Outcome of ICD Implantation in Patients With Left Ventricular Ejection Fraction <20%

C. Narasimhan, A. Dhala, S. Deshpande, J. Sra, K. Handa, M.R. Jazayeri, M. Akhtar. *Sinai Samaritan/St. Luke's Medical Centers, Milwaukee, WI, USA*

It is generally believed that in patients with severe left ventricular dysfunction (LVEF < 20%), ICD implantation is unlikely to be beneficial because of high operative mortality and non-arrhythmic cardiac death. However, there is no data on the feasibility and long-term clinical outcome of ICD implant in this group of patients. The operative morbidity, mortality (30 days) and long-term survival of patients with ejection fraction <20% (Group I) were compared with those with ejection fraction 20–40% (Group II). The overall survival of both groups were compared using Kaplan-Meier analysis.

| | Group I (n = 158) | Group II (n = 371) | P value |
|---|---|---|---|
| Age | 62.6 ± 11 | 63.7 ± 9.8 | ns |
| Male/female | 85%:15% | 83%:12% | ns |
| Length of hospital stay | 8.3 | 7.5 | ns |
| Concurrent CABG | 15.2% | 19.9% | ns |
| Operative mortality | 0% | 0.8% | ns |
| 4 yr survival | 70% | 80% | ns |
| App shocks | 46% | 40% | ns |

*Conclusion:* ICD implantation is feasible with acceptable morbidity and mortality in patients with very poor left ventricular function. Overall survival at 4 yrs was 70% after ICD implantation in this high risk patient group.

### 983-129 The Economic Impact of Prophylactic Defibrillators

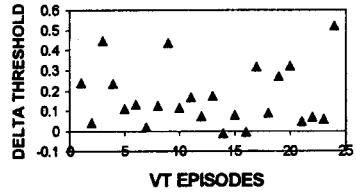
W. Boyko, K.A. Schulman, C.M. Tracy, H. Glick, A.J. Solomon. *Georgetown University Hospital, Washington, DC, USA*

In the Multicenter Automatic Defibrillator Implantation trial (MADIT) a 54% reduction in mortality was observed for post MI patients (pts) with low ejection fractions, nonsustained VT and inducible, nonsuppressible VT treated with implantable cardiovertor defibrillators (ICD) as compared to standard medical therapy. We report an economic evaluation of prophylactic ICDs for this cohort. *Methods:* Cost of care and survival data from the Studies of Left Ventricular Dysfunction (SOLVD) were analyzed for pts receiving enalapril for symptomatic congestive heart failure (CHF). Based on the MADIT study results, we modeled a new treatment arm with a 54% reduction in mortality over the SOLVD study period. Lifetime survival was computed based on a one-time benefit model (OT), assuming all treatment benefits were observed in the clinical trial, and a continuous benefit model (CO), assuming treatment benefits observed in the clinical trial continued throughout the pts lifetime. Costs of ICD placement, ICD complications, and ICD replacement were calculated based on Medicare DRG payments. *Results:* Pts who received enalapril incurred a total cost of care of $23,753 and had 5.18 discounted years of survival. Pts who received an ICD incurred CHF related costs of $29,286 and ICD related costs of $46,325 and had 6.55 discounted years of survival under the OT model. Pts who received an ICD incurred CHF related costs of $40,844 and ICD related costs of $74,764 and had 9.25 discounted years of survival under the CO model. The cost per year of life gained was $37,852 under the OT model and $22,569 under the CO model. *Conclusion:* Based on MADIT, treatment of high risk pts with an ICD would provide reasonable value for money compared to other accepted medical therapies. Further research is needed to refine treatment guidelines for post-MI pts, and to assess the generalizability of the MADIT results.

### 983-130 Correlation Waveform Analysis to Discriminate Ventricular Tachycardia From Sinus Rhythm Using Stored Electrograms From Implantable Defibrillators

G.F. Michaud, Q. Li, X. Costeas, R. Stearns, N.A.M. Estes, III, P.J. Wang. *Tufts University School of Medicine, New England Medical Center, Boston, MA, USA, Ventritex, Inc., Sunnyvale, CA, USA*

In order to examine whether correlation waveform analysis (CWA) may be used to analyze stored electrograms obtained from implantable defibrillators, we studied 25 episodes of monomorphic VT and SR. We aligned beats in phase and calculated correlation coefficients between SR beats and a SR template, VT beats and a VT template, and VT beats and a SR template. For each patient, the 99.5% lower confidence limit for the correlation coefficient of SR beats vs a SR template was used as a threshold value to discriminate VT from SR. The correlation coefficient for VT vs SR from each episode is subtracted from the threshold value as seen below.




Using this method, we were able to correctly distinguish 23/25 episodes of monomorphic VT from SR. This is the first demonstration using stored electrograms that CWA is able to discriminate monomorphic VT from SR with high sensitivity (92%). Such a system may be used for off-line analysis or real time rhythm detection.

TUESDAY POSTER